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ABSTRACT

This research project was designed to explore, in two phases, the nature of the relationship between parental behavior and children's ability to solve problems. Phase II, which is examined in this paper, deals with two specific questions: (1) Is maternal linguistic code subject to desirable modification and (2) Is the mother's perception of herself as a parent-teacher subject to desirable modification? Subjects were forty 23- and 24-year-old mothers (most of them from low-income families), who were enrolled in the Parents As Teachers Program (PAT), and their 3- to 4-year-old children. About 35% of the children were classified as Hispanic American, 63% as white and 2% as other. Three instruments were used to collect data: Parent As A Teacher (PAAT) Inventory, Parental Overall Linguistic Code (PLC) and the children's Problem Solving Abilities Continuum (PSAC). Among the conclusions: (1) the PAT program, as it existed during the 1978-79 school year, was not able to alter the mother's perception of herself as a parent-teacher when the PAAT Inventory was employed to assess this variable; (2) the children's problem solving abilities, as indicated by mean scores on the PSAC, did improve between pretests and posttests; and (3) the PAT Program can in fact alter maternal linguistic behavior as demonstrated by the significant difference existing between the maternal pretest and posttest mean scores. (Author/MP)

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AN EXPLORATION AND ANALYSIS OF PARENTAL BEHAVIORS WHICH MAY BE RELATED TO A CHILD'S PROBLEM SOLVING ABILITIES

(Phase II Report)

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Chapter I

INTRODUCTION

Purpose

The purpose of Phase II of the research project was to examine questions two and four. The major purpose of the research project was to explore the nature of the relationship between parental behavior and the child's ability to solve problems. Phase I of the research project dealt with the following questions:

1. Does a statistically significant relationship exist between the mother's linguistic code and the child's problem solving abilities?

3. Does a statistically significant, positive relationship exist between the mother's parental feelings, standards and values and her linguistic code?

   Sub question: What variable or combination of variables explains the variation in the Problem Solving Abilities scores obtained by the preschool children (three and four years olds) enrolled in the Parents As Teachers Program?

Phase II of the research project dealt with the following questions:

2. Is maternal linguistic code subject to desirable modification?

4. Is the mother's perception of herself as a parent-teacher subject to desirable modification?

   Sub question: Are children's problem solving abilities subject to improvement?

Phase II of the research report does not address the following topics: significance of the problem, assumptions and limitations, the delimitations, definition of terms and the review of related literature and research; these topics were handled in the Phase I report.

Statement of the Hypotheses

The hypotheses upon which Phase II of the research report was based are:

1. No statistically significant difference exists between pre and post mean scores earned by the mothers on the Parental Linguistic Code instrument.
   Alternate Hypothesis: Maternal linguistic pre and post mean scores are statistically different.

2. No statistically significant difference exists between pre and post mean scores earned by the mothers on Stroms Parent As A Teacher Inventory.
   Alternate Hypothesis: Maternal pre and post PAAT scores are statistically different.

Sub question: No statistically significant difference exists between pre and post mean scores earned by the children on the children's Problem Solving Abilities Continuum (PSAC).

Alternate Hypothesis: The children's pre and post PSAC scores are statistically different.

Chapter II

DESIGN OF THE STUDY

Introduction

Phase II of the research report did not address the following topics: description of the variables and data gathering instruments; these areas were covered in Phase I of the research report. The specified questions and sub question outlined in Chapter I were examined during this phase of the project.

Subjects of the Study

The sample population was comprised of 40 mother-child dyads (twenty three year olds and twenty four year olds) systematically selected from a population of 80 mother-child dyads who chose to enroll in the PAT Program. All of these families resided in Title I (ESEA) school attendance areas. Twenty-four (23.82) of all of the children residing in these school areas were classified as coming from low income families (see Chapter III, Table I, Phase I report). Almost all of the children in the sample population could have been classified as coming from low income families. About 35 percent of the children were Hispanic American while the remaining 65 percent were White (63 percent) or other (2 percent). These figures were fairly representative of the racial and ethnic make up of the district's total population (fall, 1978) (see Chapter III, Table II, Phase I report).

The project began with 40 mother-child dyads and concluded with 30 mother-child dyads. The first statistical analysis (simple correlation coefficient) that was performed in January, 1979, treated data from a sample size of 38. The second phase of statistical analysis (multiple linear regression analysis) treated data from a sample size of 37. The final statistical procedure (t-test for related samples) was performed on data from a sample size of 30.

The sample size decreased from 40 to 30 for the following reasons:

1. One family left the program because the mother was dissatisfied with the program.

2. One of the families was plagued with "chicken pox" during the post data collection period.

3. Six of the remaining eight families left the program because the mothers either obtained jobs or went back to school; two of the families moved out of the district.

Treatment

Adjustments in the PAT curriculum were made in accordance with the first statistical analysis of the data. A simple correlation coefficient was calculated to determine if a relationship did exist between the Parental Overall Linguistic Code scores and the children's Problem Solving Abilities scores (Swank). The computed correlation coefficient was .816 ($N=38$, $p<.01$). Thus,

.666 or 67 percent of the variance found among the children's Problem Solving Abilities scores could be explained by the linguistic behavior of the parents. The researcher used the above finding as a basis for determining how the PAT curriculum should be altered. The researcher and Title I Coordinator agreed upon the following plan of action:

1. Premise: Children's thinking abilities can be enhanced through question asking behavior.

2. Guidelines for parental behavior:
   a. Guide the child through a task by asking questions instead of performing the task for the child or telling the child how to perform the task.
   b. Move up the "scale of abilities" identified in the PSAC when asking questions.
   c. Provide positive feedback to the child.

The researcher observed additional parental behaviors which appeared to assist the child in solving the problem. These behaviors were observed but not systematically assessed during the project because the parental data gathering instruments failed to tap them. The researcher did share this information with the Title I Director and Coordinator, however, because it was felt it would assist them while they trained the home visitors. The additional parental behaviors which appeared to assist the child in solving the problem were:

1. Parent was patient.
2. Parent was able to perceive the problem from the child's frame of reference.

3. Parent was able to break the child's constrictive thinking.
4. Parent allowed the child to have wait time after having been asked a question.
5. Parent was able to take on the story line developed by the researcher when the problem was introduced to the child.

The researcher trained the Title I Coordinator and Project Consultant. Behaviors associated with the previously stated premise were addressed. Two training sessions were conducted with the Title I Coordinator and the Project Consultant and a research assistant. The research assistant conducted the training session for the home visitors because the researcher was ill.

Method of Data Collection

The post data were collected in two phases during the spring of 1979. Phase I covered the period when the mother-child dyads were given the Alpern Boll Developmental Profile in the children's homes.

Phase II began about one month after Phase I. During this period the mother-child dyads were exposed to the PAAT Inventory, Parental Overall Linguistic Code and the children's Problem Solving Abilities Continuum. The researcher went into the families' homes and administered the block building task associated with the PSAC and the PLC. This took about two to two and a half weeks. The home visitors administered the PAAT.

Method of Data Analysis

The statistical procedure used to analyze the data associated with questions two and four and the sub question found in Phase II of the research report was the t-test for related samples (Ferguson, p. 166-168). The t-test for the significance of the difference between means is based on the following assumptions:

1. Samples are randomly selected: therefore the role played by individual differences which may be related to the dependent variable has been addressed.

2. The target population is normally distributed on the dependent variable.

3. The variances of the two groups on the dependent variable are equal.

4. The population means are equal.

Assumption number two was violated, however, because the scores earned by the parents on the PLC and the children on the PSAC indicated that the sample subjects were not normally distributed (consult appendix C in the Phase I report) in the dependent variable. Violation of assumption two will not affect the validity of the t-test if the researcher follows the central limits theorem which asserts:

> "Regardless of the shape of the population distribution, the sampling distribution of means, drawn from a population with σ^2 and mean u will approach normal distribution with σ^2/N as sample size N increases (Ferguson, 141)."

Thus assumption two can be violated if the sample size (N) is at least 30. Heimerl (Winter, 1978) contended that if the researcher is unsure about assumption three, then he/she should keep the sample sizes of both groups (N's) equal or very near equal and follow the central limits theorem (N=at least 30).

The difference method operates in the following manner (Ferguson, 166-168):

1. The researcher obtains the difference between N paired observations where X_1 (Pre) and X_2 (Post) denotes the observations and $X_1 - X_2 = D$ denotes the difference between the paired observations.

2. The mean difference over all of the paired observations is represented by $\Sigma D/N = \overline{D}$.

3. The difference between the two groups ($\overline{X}_1$ (Pre) and $\overline{X}_2$ (Post) is equal to the mean difference ($\overline{D}$). Thus, $\overline{X}_1 - \overline{X}_2 = \overline{D}$.

4. The significance of the difference between the two means ($\overline{X}_1$ (Pre) and $\overline{X}_2$ (Post) is determined by testing whether or not $\overline{D}$ is significantly different from 0.

The following computational formula was employed by the researcher:

$$t = \frac{\Sigma D}{\sqrt{(N\Sigma D^2 - (\Sigma D)^2) / N-1}}$$

where:

$D = X_1 - X_2$
X_1 = Pre test score
X_2 = Post test score
N^2 = 30/N= # of paired observations
df = N-1 = 30-1 = 29

Chapter III

ANALYSIS OF THE DATA

Phase II of the research project dealt with the following questions:

2. Is maternal linguistic code subject to desirable modification?
4. Is the mother's perception of herself as a parent-teacher subject to desirable modification?

   Sub-question: Are children's problem solving abilities subject to improvement?

The appropriate data were analyzed in the following sequence:

1. T-test was performed on the pre and post scores earned by the mothers on the Parental Linguistic Code.
2. T-test was performed on the pre and post Parent Question Asking subscores earned by the mothers.
3. T-test was performed on the pre and post scores earned by the mothers on the PAAT.
4. T-test was performed on the pre and post scores earned by the children on the PSAC.

The hypothesis associated with the first statistical analysis was:

No statistically significant difference exists between pre and post mean scores earned by the mothers on the Parental Linguistic Code ($u_1 = u_2$).

The alternate hypothesis was:

Maternal linguistic pre and post mean scores are statistically different ($u_1 \neq u_2$). The selected alpha level was .05. The T-test was performed on the data and the results were t = 3.92 (N = 30, df = 29, $p < .001$, two tailed test). The statistical conclusion was that the pre and post mean scores (pre $\overline{X}$, = 329.8, s = 246.55; post $\overline{X}_2$ = 221.47, s = 166.46) are different. The researcher can conclude that the scores are statistically different; the difference can be attributed to parental involvement in the PAT program. The T-test performed on the pre and post mean Parental Question Asking Subscores was 3.49 (N=30, df = 29, $p < .01$, two tailed). The statistical conclusion was that the pre and post mean scores (pre $\overline{X}$, = 174.07, s = 163.36; post $\overline{X}_2$ = 113, s = 106.8) are different. The researcher can conclude that the scores are statistically different; the difference can be attributed to parental involvement in the PAT Program.

The hypothesis associated with question four stated that no statistically significant difference exists between pre and post mean scores earned by the mothers on PAAT ($u_1 = u_2$). The alternate hypothesis was that maternal pre and post PAAT scores are statistically different ($u_1 < u_2$). The selected alpha level was .05 (one tailed). The T-test was performed and the results obtained were t = .01 (N=30, df=29, $p > .05$, one tailed). The statistical analysis indicated that the pre and post mean scores (pre $\overline{X}$, = 140.53, s = 23.96; post $\overline{X}_2$ = 140.40, s=12.50) are not statistically different. Parental involvement in the PAT Program did not alter the parent's perception of herself as a parent teacher.

The hypothesis associated with the sub-question was that no statistically significant difference existed between pre and post mean scores earned by the children on the PSAC ($u_1 = u_2$). The alternate hypothesis stated that the pre and post mean PSAC scores were statistically different ($u_1 \neq u_2$). The T-test for related samples was performed on the data and the following results were obtained: $t = -3.05$ ($N=30$, $df=29$, $p < .01$, two tailed). The researcher concluded that the pre and post mean scores (pre $\overline{X}_1 = 165.4$, $s=96.33$; post $\overline{X}_2=216.4$, $s=95.99$) are statistically different. The researcher cannot conclude that involvement in the PAT Program caused this increase as maturation could have played a role in this phenomenon.

Chapter IV

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of Phase II of the research project was to examine questions two, four, and the sub question. The questions examined during this phase of the project were:

2. Is maternal linguistic code subject to desirable modification?
4. Is the mother's perception of herself as a parent-teacher subject to desirable modification?

   Sub question: Are children's problem solving abilities subject to improvement?

The hypotheses associated with these questions were:

2. No statistically significant difference exists between pre and post mean scores earned by the mothers on the Parental Linguistic Code Instrument.

   Alternate hypothesis: Maternal linguistic pre and post mean scores are statistically different.
4. No statistically significant difference exists between pre and post mean scores earned by the mothers on Strom's Parent As A Teacher Inventory.

   Alternate hypothesis: Maternal pre and post PAAT scores are statistically different.

   Sub question: No statistically significant difference exists

between pre and post mean scores earned by the children on the children's Problem Solving Abilities Continuum (PSAC).

Alternate hypothesis: The children's pre and post PSAC scores are statistically different.

The sample population was comprised of 40 mother-child dyads (twenty three year olds and twenty four year olds) systematically selected from a population of 80 mother-child dyads who chose to enroll in the PAT program. The pre and post data analysis was conducted on a sample of 30 mother-child dyads (N = 30, 15 males and 15 females, 15 three year olds and 15 four year olds). All of these families resided in Title I (ESEA) school attendance areas. Twenty-four percent (23.82) of all the children residing in these school areas were classified as coming from low income families. Almost all of the children in the sample population could have been classified as coming from low income families. About 35 percent of the children were Hispanic American while the remaining 65 percent were White (63 percent) or other (2 percent). These figures were fairly representative of the racial and ethnic make up of the district's total population.

The t-test for related samples (Ferguson, p. 166) was performed on the data. A t-test of 3.92 ($N = 30$, $df = 29$, $p < .001$, two tailed) was obtained for the analysis of the pre and post mean scores earned by the mothers on the Parental Linguistic Code. This statistical finding means that the pre and post mean scores were statistically different.

The t-test performed on the pre and post PAAT mean scores yielded a $t = .01$ ($N=30$, $df = 29$, $p > .05$, one tailed). This statistical finding means that the

pre and post PAAT mean scores were not statistically different.

The t-test performed on the data associated with the sub question yielded a $t = -3.05$ ($N = 30$, $df = 29$, $p < .01$, two tailed). This statistical finding means that the children's pre and post mean scores were statistically different.

Conclusions

The following conclusions have been drawn from the data:

1. The PAT Program can in fact alter maternal linguistic behavior as demonstrated by the significant difference ($t = 3.92$, $N = 30$, $df = 29$, $p < .001$) existing between the maternal pre and post mean scores. The maternal Parental Linguistic Code post mean score was significantly lower than the pre mean score. It can be concluded that this difference was due to the "parent as a teacher" behavior modeled by the home visitors when they worked with the mother-child dyads.

2. The PAT program as it existed during the school year 1978-79 was not able to alter the mother's perception of herself as a parent-teacher when Strom's PAAT Inventory was employed to assess this variable.

3. The children's problem solving abilities as measured on the PSAC did improve as demonstrated by the analysis of the difference between the pre and post mean scores earned by the children on the PSAC

($t = 3.05$, $N = 30$, $df = 29$, $p < .01$, two tailed). One cannot conclude based on the statistical data that involvement in the PAT program alone caused this improvement; it would seem logical that the children's involvement in the PAT program could have contributed to an explanation in the difference existing between the children's pre and post mean scores. The decrease in the maternal post overall Parental Linguistic mean score and the Parental Question Asking mean score could be related to the increase in the children's PSAC post mean scores. Perhaps the children needed less help from their mothers because they had improved in their problem solving abilities; no statistical data exists to support this conclusion, however.

Recommendations

The following recommendations stem from this investigation:

1. The Parental Linguistic Code instrument should be refined in order to tap the following parental behaviors:

   a. Parental timing of questioning.
   b. Parent's ability to determine when the child was actually unable to perform the task and demonstrated this fact by merely playing with the blocks, ignoring the blocks, or engaging in another activity and when the child was just engaging in exploratory behavior prior to entering into the task.
   c. Parental patience.
   d. Parent was able to perceive the problem from the child's frame of reference.

e. Parent was able to break the child's constrictive thinking by asking a question or making a statement.

f. Parent provided wait time, i.e., the parent expected the child to take time and think before responding to a question.

g. Parent took on the story line associated with the problem solving task.

Parental timing in terms of intervention appeared to be operating during the post period of data collection.

The parents appeared to assume the following posture:

1. The child should solve the problem on his own.
2. I will assist him/her when he/she is stuck or requests help.
3. I will assist my child by asking questions and making encouraging statements instead of doing for the child or commenting or just talking for the sake of talking. (Perhaps this change in posture was needed by the mothers of daughters. See the sections in Chapters IV and V in the Phase I report dealing with the interaction variable).

The second recommendation would be to have a control group. The use of a control group would assist the Title I Coordinator in determining if the child's involvement in the PAT program does in fact cause his or her problem solving abilities to improve.

Furthermore, the block structure associated with the PSAC could be altered during the post data collection period. The children would be exposed to a Form A

and Form B structure. The structures would parallel each other in terms of components and difficulty but they would differ in the area of the spatial arrangement of certain parts of the structures. The same structure was used during the pre and post periods of this study, but the accompanying figures and story were altered (see Appendix B of the Phase I report). While one could argue that the "practice effect" may have been operating during the post phase of the project this is probably not likely. None of the children were able to complete the task without assistance. Also, the children tended to employ cognitively more complex abilities (analysis of elements, analysis of relationships, and analysis of organizational principles) during the post session. The children gained the needed insight to solve the problem by focusing on the elements of the problem as well as clues from their mothers. Thus, an improvement in the children's scores could be related to the posture assumed by the child: "I can solve this problem by gaining clues from within (the structure) as well as from without (parent)." The alteration of the block structure during the post session could possibly establish a situation for assessing this posture as well as eliminating the possible "practice effect."

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